What Is Claimed Is:

1. An integrated circuit assembly module, comprising:

a first substrate, with a front face and a back face opposite the front face;

a first semiconductor die with an active face upon which active circuitry and signal pads reside, and a back face opposite the active face;

a second semiconductor die with an active face upon which active circuitry and signal pads reside, and a back face opposite the active face;

a second substrate, with a front face and a back face opposite the front face;

wherein the first semiconductor die and the second semiconductor die are arranged active face to active face so that signal pads on the first semiconductor die overlap with signal pads on the second semiconductor die, thereby facilitating capacitive communication between the first semiconductor die and the second semiconductor die; and

wherein the first semiconductor die and the second semiconductor die are pressed together between the first substrate and the second substrate so that the front face of the first substrate is in contact with the back face of the first semiconductor die and the front face of the second substrate is in contact with the back face of the second semiconductor die.

2. The integrated circuit assembly module of claim 1, further comprising:

a first heat removal mechanism coupled to the back face of the first substrate; and

a second heat removal mechanism coupled to the back face of the second substrate.

3. The integrated circuit assembly module of claim 2, wherein the first and second heat removal mechanisms include cooling fins to facilitate the transfer of heat to air passing across the cooling fins.

4. The integrated circuit assembly module of claim 2, wherein the first and second heat removal mechanisms include graphite foam or metal with fin-like structures which facilitate in the transfer of heat to a liquid pumped through the graphite foam or metal.

5. The integrated circuit assembly module of claim 1, further comprising:

a first power supply coupled to the back face of the first substrate; and

a second power supply coupled to the back face of the second substrate.

6. The integrated circuit assembly module of claim 1, wherein the first and second substrates include metal layers that supply power to the first and second semiconductor dies.

7. The integrated circuit assembly module of claim 6, wherein the first and second substrates include power connectors on the back faces of the first and second substrates.

8. The integrated circuit assembly module of claim 6, further comprising Micro Electro-Mechanical System (MEMS) spring contacts that provide power from the metal layers within the first and second substrates to the first and second semiconductor dies, wherein:

a first set of MEMS spring contacts on the front face of the first substrate contact the active side of the second semiconductor die; and

a second set of MEMS spring contacts on the front face of the second substrate contact the active side of the first semiconductor die.

9. The integrated circuit assembly module of claim 6, further comprising:

a first power regulator incorporated within the first substrate; and

a second power regulator incorporated within the second substrate.

10. The integrated circuit assembly module of claim 1, further comprising:

an I/O semiconductor die with an active face upon which active circuitry and signal pads reside, and a back face opposite the active face;

wherein the I/O semiconductor die and the second semiconductor die are arranged active face to active face, so that signal pads on the I/O semiconductor die overlap with signal pads on the second semiconductor die, thereby facilitating capacitive communication between the I/O semiconductor die and the second semiconductor die;

wherein the I/O semiconductor die is located on an edge of the first substrate to facilitate in providing communications into and out of the integrated circuit assembly module; and

wherein the edge of the first substrate extends beyond the edge of the second substrate so that a portion of the active face of the I/O semiconductor die is exposed to facilitate external connections.

11. The integrated circuit assembly module of claim 10, further comprising optical external connection pads located on the exposed portion of the active side of the I/O semiconductor die.

12. The integrated circuit assembly module of claim 10, further comprising electrical external connection pads located on the exposed portion of the active side of the I/O semiconductor die.

13. A method for fabricating an integrated circuit assembly module, comprising:

arranging a first semiconductor die and a second semiconductor die active face to active face such that signal pads on the first semiconductor die overlap with signal pads on the second semiconductor die, thereby facilitating capacitive communication between the first semiconductor die and the second semiconductor die, and wherein the first and second semiconductor dies comprise an active face upon which active circuitry and signal pads reside, and a back face opposite the active face; and

pressing together the first semiconductor die and the second semiconductor die between a first substrate and a second substrate such that the first substrate is in contact with the back face of the first semiconductor die and the second substrate is in contact with the back face of the second semiconductor die.

14. The method of claim 13, wherein the integrated circuit assembly module further comprises:

a first heat removal mechanism coupled to the opposite side of the first substrate from the first semiconductor die; and

a second heat removal mechanism coupled to the opposite side of the second substrate from the second semiconductor die.

15. The method of claim 14, wherein the first and second heat removal mechanisms include cooling fins to facilitate the transfer of heat to air blown across the cooling fins.

16. The method of claim 14, wherein the first and second heat removal mechanisms include graphite foam or metal with fin-like structures which facilitate in the transfer of heat to a liquid pumped through the graphite foam or metal.

17. The method of claim 13, wherein the integrated circuit assembly module further comprises:

a first power supply coupled to the opposite side of the first substrate from the first semiconductor die; and

a second power supply coupled to the opposite side of the second substrate from the second semiconductor die.

18. The method of claim 13, wherein the first and second substrates include metal layers that facilitate in supplying power to the first and second semiconductor dies.

19. The method of claim 18, wherein the first and second substrates include power connectors on the opposite sides of the first and second substrates from the first and second semiconductor dies.

20. The method of claim 18, wherein the integrated circuit assembly module further comprises Micro Electro-Mechanical System (MEMS) spring contacts that facilitate in providing power from the metal layers within the first and second substrates to the first and second semiconductor dies, wherein:

a first plurality of MEMS spring contacts attached to the semiconductor die side of the first substrate that contact the active side of the second semiconductor die; and

a second plurality of MEMS spring contacts attached to the semiconductor die side of the second substrate that contact the active side of the first semiconductor die.

21. The method of claim 18, wherein the integrated circuit assembly module further comprises:

a first power regulator incorporated within the first substrate; and

a second power regulator incorporated within the second substrate.

22. The method of claim 13, wherein the integrated circuit assembly module further comprises:

an I/O semiconductor die with an active face upon which active circuitry - including signal pads - resides, and a back face opposite the active face;

wherein the I/O semiconductor die and the second semiconductor die are arranged active face to active face such that signal pads on the I/O semiconductor die overlap with signal pads on the second semiconductor die, thereby facilitating capacitive communication between the I/O semiconductor die and the second semiconductor die;

wherein the I/O semiconductor die is located on the edge of the first substrate to facilitate in providing communications in and out of the integrated circuit assembly module; and

wherein the edge of the first substrate extends beyond the edge of the second substrate such that a portion of the active face of the I/O semiconductor die is exposed to facilitate external connections.

23. The method of claim 10, wherein the integrated circuit assembly module further comprises optical external connection pads located on the exposed portion of the active side of the I/O semiconductor die.

24. The method of claim 10, wherein the integrated circuit assembly module further comprises electrical external connection pads located on the exposed portion of the active side of the I/O semiconductor die.

25. A computer system comprising an integrated circuit assembly module, comprising:

a first substrate, with a front face and a back face opposite the front face;

a first semiconductor die with an active face upon which active circuitry and signal pads reside, and a back face opposite the active face;

a second semiconductor die with an active face upon which active circuitry and signal pads reside, and a back face opposite the active face;

a second substrate, with a front face and a back face opposite the front face;

wherein the first semiconductor die and the second semiconductor die are arranged active face to active face so that signal pads on the first semiconductor die overlap with signal pads on the second semiconductor die, thereby facilitating

capacitive communication between the first semiconductor die and the second semiconductor die; and

wherein the first semiconductor die and the second semiconductor die are pressed together between the first substrate and the second substrate so that the front face of the first substrate is in contact with the back face of the first semiconductor die and the front face of the second substrate is in contact with the back face of the second semiconductor die.

26. The computer system of claim 25, wherein the integrated circuit assembly module further comprises:

a first heat removal mechanism coupled to the back face of the first substrate; and

a second heat removal mechanism coupled to the back face of the second substrate.

27. The computer system of claim 26, wherein the first and second heat removal mechanisms include cooling fins to facilitate the transfer of heat to air passing across the cooling fins.

28. The computer system of claim 26, wherein the first and second heat removal mechanisms include graphite foam or metal with fin-like structures which facilitate in the transfer of heat to a liquid pumped through the graphite foam or metal.

29. The computer system of claim 25, further comprising:

a first power supply coupled to the back face of the first substrate; and

a second power supply coupled to the back face of the second substrate.

30. The computer system of claim 25, wherein the first and second substrates include metal layers that supply power to the first and second semiconductor dies.

31. The computer system of claim 30, wherein the first and second substrates include power connectors on the back faces of the first and second substrates.

32. The computer system of claim 30, wherein the integrated circuit assembly module further comprises Micro Electro-Mechanical System (MEMS) spring contacts that provide power from the metal layers within the first and second substrates to the first and second semiconductor dies, wherein:

a first set of MEMS spring contacts on the front face of the first substrate contact the active side of the second semiconductor die; and

a second set of MEMS spring contacts on the front face of the second substrate contact the active side of the first semiconductor die.

33. The computer system of claim 30, wherein the integrated circuit assembly module further comprises:

a first power regulator incorporated within the first substrate; and

a second power regulator incorporated within the second substrate.

34. The computer system of claim 25, wherein the integrated circuit assembly module further comprises:

an I/O semiconductor die with an active face upon which active circuitry and signal pads reside, and a back face opposite the active face;

wherein the I/O semiconductor die and the second semiconductor die are arranged active face to active face, so that signal pads on the I/O semiconductor die overlap with signal pads on the second semiconductor die, thereby facilitating capacitive communication between the I/O semiconductor die and the second semiconductor die;

wherein the I/O semiconductor die is located on an edge of the first substrate to facilitate in providing communications into and out of the integrated circuit assembly module; and

wherein the edge of the first substrate extends beyond the edge of the second substrate so that a portion of the active face of the I/O semiconductor die is exposed to facilitate external connections.

35. The computer system of claim 34, wherein the integrated circuit assembly module further comprises optical external connection pads located on the exposed portion of the active side of the I/O semiconductor die.

36. The computer system of claim 34, wherein the integrated circuit assembly module further comprises electrical external connection pads located on the exposed portion of the active side of the I/O semiconductor die.